

EXPRESS MAIL NO. EV335395369US



AU9517893

(12) PATENT ABSTRACT (11) Document No. AU-A-17893/95
(19) AUSTRALIAN PATENT OFFICE

(54) Title
AN EVAPORATIVE AIR CONDITIONING SYSTEM

International Patent Classification(s)
(51)⁶ F24F 006/04 F24F 013/28

(21) Application No. : 17893/95 (22) Application Date : 05.05.95

(30) Priority Data

(31) Number (32) Date (33) Country
PM5433 05.05.94 AU AUSTRALIA

(43) Publication Date : 16.11.95

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An evaporative air conditioning system is disclosed. The system is adapted to be positioned in the ceiling space of a roof 5 of a house with minimal exposure above the roof-line of the roof 5 and is operable to cool air from outside the house and to transfer cooled air to a ducting network for distributing cooled air through the house. The system comprises, 3 air inlet chambers 3 extending above the roof-line of the roof 5, with each air inlet chamber 3 being defined in part by porous filter pads 7 for allowing air to flow therethrough into the air inlet chambers 3. The system further comprises a water distribution system for circulating water through the filter pads 7 to cool air by evaporation of water and a cooled air distribution system for transferring cooled air into the ducting network.

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-2-

CLAIM

1. An evaporative air conditioning system for a house comprising:

- (a) a series of air inlet chambers extending above the roof of the house, each air inlet chamber being defined in part by a filter pad for allowing air to flow therethrough into the air inlet chamber;
- (b) a water distribution system for circulating water through the filter pads to cool air flowing through the filter pads;
- (c) a main chamber positioned in the ceiling space of the house and connected to the inlet chambers for receiving cooled air from the filter pads, the main chamber having an outlet connected to a ducting network for distributing cooled air through the house; and
- (d) a fan assembly for drawing air through the filter pads into the inlet chambers and the main chamber and subsequently as cooled air through the outlet into the ducting network.

AUSTRALIA
Patents Act 1990

COMPLETE SPECIFICATION
STANDARD PATENT

Applicant:

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A.C.N. 004 783 493

Invention Title:

AN EVAPORATIVE AIR CONDITIONING SYSTEM

The following statement is a full description of this invention, including the best method of performing it known to us:

- 2 -

AN EVAPORATIVE AIR CONDITIONING SYSTEM

The present invention relates to an evaporative air conditioning system which is suited particularly for cooling houses.

5 A conventional domestic evaporative air conditioning system comprises, a housing having side walls formed from porous filter pads, a top wall, and a base wall with an outlet connected to a ducting network for distributing cool air through the house. The air
10 conditioning system further comprises, a water distribution system for circulating water through the filter pads, and an axial fan for drawing air through the filter pads into the housing and from the housing through the outlet. In
15 the air conditioning system the relatively hot air drawn into the housing is cooled by evaporation of water

- 3 -

circulating through the filter pads.

The effectiveness of the air conditioning system for any given space to be cooled depends on a number of factors including, the surface area of the filter pads, the flow rate of water delivered to the filter pads, and the size and performance of the axial fan.

Another important factor is to ensure that the air conditioning system is positioned so that, as far as possible, there is unrestricted air flow to the filter pads. As a consequence, this means that it is preferable that the air conditioning system be installed to stand well above the roof line at the highest section of a house. The result of such positioning of an air conditioning system is to make the air conditioning system a prominent visual feature of a house and this may be regarded by the householder as a disadvantage on the basis that it detracts from the appearance of the house. In addition, such positioning of the air conditioning system may make difficult regular maintenance of the air conditioning system which is important to ensure optimum performance.

An object of the present invention is to provide a domestic evaporative air conditioning system which alleviates the disadvantages of the conventional air conditioning system described above.

According to the present invention there is provided an evaporative air conditioning system for a house comprising:

(a) a series of air inlet chambers extending above the roof of the house, each air inlet chamber being defined in part by a filter pad for allowing air to flow therethrough into the air inlet chamber;

- 4 -

- (b) a water distribution system for circulating water through the filter pads to cool air flowing through the filter pads;
- 5 (c) a main chamber positioned in the ceiling space of the house and connected to the inlet chambers for receiving cooled air from the filter pads, the main chamber having an outlet connected to a ducting network for distributing cooled air through
10 the house; and
- (d) a fan assembly for drawing air through the filter pads into the inlet chambers and the main chamber and subsequently as cooled air
15 through the outlet into the ducting network.

It can readily be appreciated that the evaporative air conditioning system of the present invention as described above is adapted to be located substantially in the ceiling space of a house and thus
20 would have minimal visual impact and be more readily accessible for servicing.

It is preferred that the fan assembly comprise an axial fan.

It is preferred particularly that the axial fan
25 be positioned in the outlet of the main chamber.

It is preferred that the inlet chambers extend through openings in the roof.

It is preferred particularly that the inlet chambers be dimensioned to fit between adjacent rafters of
30 the roof.

- 5 -

It is preferred more particularly that each inlet chamber comprise, a front wall and a rear wall extending transversely to the roof rafters, and side walls extending parallel to the roof rafters, with the filter pads
5 substantially defining the front and rear walls.

With such an arrangement it is preferred particularly that the inlet chambers be arranged in a line extending up the roof-line, with a sufficient gap between adjacent inlet chambers to allow unrestricted air flow to
10 the filter pad in the rear wall of a lower inlet chamber and the filter pad in the front wall of an adjacent higher inlet chamber.

According to the present invention there is also provided an evaporative air conditioning system for a house
15 comprising:

The present invention is described further with reference to the accompanying drawings in which:

- 20 (a) a series of air inlet chambers adapted to be positioned to extend through openings in the roof of the house so that the air inlet chambers extend above the roof, each air inlet chamber being defined in part by a filter pad for allowing air to flow therethrough into the air inlet chamber;
- 25 (b) a water distribution system adapted to circulate water through the filter pads to cool air flowing through the filter pads;
- 30 (c) a main chamber adapted to be positioned in the ceiling space of the house and to be connected to the inlet chambers for receiving cooled air from the filter pads,

- 6 -

the main chamber having an outlet adapted to be connected to a ducting network for distributing cooled air through the house; and

- 5 (d) a fan assembly adapted to draw air through the filter pads into the inlet chambers and the main chamber and subsequently as cooled air through the outlet into the ducting network.

10 Figure 1 is a vertical section through a preferred embodiment of an evaporative air conditioning system in accordance with the present invention installed in a house; and

15 Figure 2 is a section along the line 2-2 in Figure 1.

The preferred embodiment of the evaporative air conditioning system of the present invention shown in the figures is positioned substantially in the ceiling space of a roof 5 of a house and has minimal exposure above the
20 roof-line of the roof 5 when compared with the conventional evaporative air conditioning system 5 and is operable to cool air from outside the house and to transfer cooled air to a ducting network for distributing cooled air through the house.

25 The air conditioning system comprises, 3 air inlet chambers 3 extending above the roof-line of the roof 5, with each air inlet chamber 3 being defined in part by porous filter pads 7 for allowing air to flow therethrough into the air inlet chambers 3.

30 The inlet chambers 3 are constructed to fit between a pair of adjacent rafters 15 (Figure 2) of the

- 7 -

roof 5 and are arranged spaced apart up the roof-line between the adjacent rafters 15. When viewed in the direction of the arrow A in Figure 1, each inlet chamber 3 comprises, front and rear walls which are defined by
5 removable filter pads 7, side walls 21 which are parallel to the rafters 15, and a removable top wall 23.

In the preferred embodiment of the present invention shown in the figures the filter pads 7 comprise
10 CELdek filter pads distributed in Australia by Munters Aust. Pty. Ltd. The CELdek filter pads have a honeycomb configuration which defines a substantial number of long channels for air to flow through into the inlet chambers 3.

The air conditioning system further comprises a water distribution system for circulating water downwardly
15 through the filter pads 7 to cool air flowing through the filter pads 7 by evaporation of the water.

The water distribution system comprises, a sump 27 adjacent the front wall of the lowest air inlet chamber 3 for holding a supply of water, and a plurality of water
20 delivery conduits 25 which run from the sump 27 and terminate in an array of spaced apart water delivery nozzles 26 positioned above the upper ends of the filter pads 7 so that water can flow downwardly through the nozzles 26 and be absorbed by the filter pads 7.

25 The water distribution system further comprises a pump 29 in the sump 27 for pumping water through the water delivery conduits 25 to the water delivery nozzles 26.

30 The water distribution system further comprises a drainage system for returning excess water from to the filter pads 7 to the sump 27. The drainage system comprises, troughs 31 positioned beneath each filter pad 7,

- 8 -

and return channels 33 at the ends of the troughs 31 which run parallel to the rafters 15 and connect the troughs 31 to the sump 27.

5 The water distribution system further comprises a connection to an external source of water to make-up water lost to the system by evaporation.

10 The air conditioning system further comprises an elongate main chamber 9 positioned in the ceiling space 17 of the house beneath the inlet chambers 3. The main chamber 9 is connected to the inlet chambers 3 to receive the air cooled by the filter pads 7. The main chamber 9 is closed at one end and has an outlet 13 at the opposite end which is coupled to a ducting network (not shown) to distribute cooled air to the rooms of the house.

15 The air conditioning system further comprises an axial fan 11 positioned in the outlet 13 downstream of the connections between the main chamber 9 and the inlet chambers 3 and operable to draw air through the filter panels 7 into the inlet chambers 3 and the main chamber 9
20 and through the outlet 13 into the ducting network.

 The dimensions of the preferred embodiment of the air conditioning system shown in the drawings may be selected as required to cool a given air space. In a typical case it is proposed that:

- 25 (a) the front and rear walls of the air inlet chambers 3 be 600 mm, which corresponds with the typical roof rafter spacing;
- (b) the front walls of the air inlet chambers 3 extend between 250 - 300 mm above the roof-
30 line of a roof 5;

- 9 -

(c) the CELdek filter pads be 75 mm thick; and

(d) there be a spacing of 120 mm between the front and rear walls of the air inlet chambers 3.

5 The preferred embodiment of the air conditioning system of the present invention has the advantages over the conventional evaporative air conditioning system that it is substantially located in the ceiling space of a house and is not a prominent visual feature of the house and the
10 filter pads 7 can be accessed easily for regular cleaning which is important to maintain optimum performance.

 Furthermore, it has been found by the applicant in experimental work that the arrangement of the inlet chambers 3, the main chamber 9, and the axial fan 11 in the
15 outlet 13 is unexpectedly quieter and generates less vibration than the conventional evaporative air conditioning system.

 Many modifications may be made to the preferred embodiment described with reference to the drawings without
20 departing from the spirit and scope of the present invention.

 In this regard, whilst the preferred embodiment comprises 3 inlet chambers 3 having front and rear walls defined substantially by filter pads 7, it can readily be
25 appreciated that the present invention is not so limited and extends to any suitable number and configuration of inlet chambers 3.

 Furthermore, whilst the preferred embodiment comprises CELdek filter pads 7, it can readily be
30 appreciated that the present invention is not so limited and extends to any suitable filter pad.

- 10 -

Finally, whilst the preferred embodiment comprises an axial fan 11, it can readily be appreciated that the present invention is not so limited and extends to any suitable fan assembly.

- 11 -

CLAIMS

1. An evaporative air conditioning system for a house comprising:
 - 5 (a) a series of air inlet chambers extending above the roof of the house, each air inlet chamber being defined in part by a filter pad for allowing air to flow therethrough into the air inlet chamber;
 - 10 (b) a water distribution system for circulating water through the filter pads to cool air flowing through the filter pads;
 - 15 (c) a main chamber positioned in the ceiling space of the house and connected to the inlet chambers for receiving cooled air from the filter pads, the main chamber having an outlet connected to a ducting network for distributing cooled air through the house; and
 - 20 (d) a fan assembly for drawing air through the filter pads into the inlet chambers and the main chamber and subsequently as cooled air through the outlet into the ducting network.
- 25 2. The system defined in claim 1 wherein the fan assembly comprises an axial fan.
3. The system defined in claim 2 wherein the axial fan is positioned in the outlet of the main chamber.
4. The system defined in any one of the preceding

- 12 -

claims wherein the inlet chambers extend through openings in the roof.

5. The system defined in claim 4 wherein the inlet chambers fit between adjacent rafters of the roof.

5 6. The system defined in claim 5 wherein that each inlet chamber comprises, a front wall and a rear wall extending transversely to the roof rafters and side walls extending parallel to the roof rafters, with the filter pads substantially defining the front and rear walls.

10 7. The system defined in claim 6 wherein that the inlet chambers are arranged in a line extending up the roof-line, with a sufficient gap between adjacent inlet chambers to allow unrestricted air flow to the filter pad in the rear wall of a lower inlet chamber and the filter
15 pad in the front wall of an adjacent higher inlet chamber.

8. An evaporative air conditioning system for a house comprising:

(a) a series of air inlet chambers adapted to be positioned to extend through openings in
20 the roof of the house so that the air inlet chambers extend above the roof, each air inlet chamber being defined in part by a filter pad for allowing air to flow therethrough into the air inlet chamber;

25 (b) a water distribution system adapted to circulate water through the filter pads to cool air flowing through the filter pads;

(c) a main chamber adapted to be positioned in the ceiling space of the house and to be
30 connected to the inlet chambers for

- 13 -

receiving cooled air from the filter pads,
the main chamber having an outlet adapted
to be connected to a ducting network for
distributing cooled air through the house;
and

5

(d) a fan assembly adapted to draw air through
the filter pads into the inlet chambers and
the main chamber and subsequently as cooled
air through the outlet into the ducting
network.

10

9. An evaporative air conditioning system for a
house substantially as herein described with reference to
the accompanying drawings.

DATED THIS 5TH DAY OF MAY 1995

15 BRIVIS AUSTRALIA PTY. LTD.
By Its Patent Attorneys"

GRIFFITH HACK & CO
Fellow Institute of Patent
Attorneys of Australia

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- 14 -

ABSTRACT

An evaporative air conditioning system is disclosed. The system is adapted to be positioned in the ceiling space of a roof 5 of a house with minimal exposure above the roof-line of the roof 5 and is operable to cool air from outside the house and to transfer cooled air to a ducting network for distributing cooled air through the house. The system comprises, 3 air inlet chambers 3 extending above the roof-line of the roof 5, with each air inlet chamber 3 being defined in part by porous filter pads 7 for allowing air to flow therethrough into the air inlet chambers 3. The system further comprises a water distribution system for circulating water through the filter pads 7 to cool air by evaporation of water and a cooled air distribution system for transferring cooled air into the ducting network.

